NON-PUBLIC?: N
ACCESSION #: 9210260299
LICENSEE EVENT REPORT (LER)

FACILITY NAME: St. Lucie Unit 1 PAGE: 1 OF 04

DOCKET NUMBER: 05000335

TITLE: Automatic Reactor Trip on Turbine Generator Loss of Load due to equipment failure.
EVENT DATE: 09/24/92 LER #: 92-006-00 REPORT DATE: 10/22/92

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 043

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: M.J. Snyder, Shift Technical Advisor TELEPHONE: (407) 465-3550

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JJ COMPONENT: CAP MANUFACTURER: W120
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 24 September 1992, St. Lucie Unit 1 was holding power at 43% while awaiting the return to service of the 1B Steam Generator Feedwater pump. At 1138, the reactor automatically tripped on a Turbine Generator Loss of Load signal from the Reactor Protection System. Operators implemented EOP-1 Standard Post Trip Actions, stabilizing the unit in Mode 3 utilizing the Steam Bypass Control System and by manually starting the 1A and 1B Auxiliary Feedwater Pumps. Three sets of Safety Function Status Checks were satisfactorily accomplished as per EOP-2, Reactor Trip Recovery.

The cause of the turbine trip was a momentary interruption of 15VDC bus power to the turbine Digital Electro-Hydraulic (DEH) control system. Interruption of power to the + or - 15VDC bus will result in a turbine and reactor trip. The root cause of the momentary interruption of power to the 15VDC bus was most likely due to the failure of a filter capacitor

in a turbine speed control circuit card. This capacitor is suspected to have shorted to common ground, momentarily dropping 15VDC voltage, and then failed open.

Corrective actions: The turbine speed control circuit board with the failed capacitor was replaced; the utility maintenance instrumentation & Controls (I&C) department verified the operability of the remaining turbine DEH control circuit cards, looking for similar filter capacitor failures; I&C verified the operability of the six DC power supplies in the turbine control system; the vendor for the turbine control system was consulted to assist in troubleshooting and to validate the root cause of this event; the circuit board with the failed filter capacitor will be evaluated to determine the specific cause of the failure and any generic implications.

END OF ABSTRACT

DESCRIPTION OF THE EVENT

On 24 September 1992, St. Lucie Unit 1 was holding power at 43% while awaiting the return to service of the 1B Steam Generator Feedwater pump (EIIS:SJ). At 1138, the reactor automatically tripped on a Turbine Generator Loss of Load signal from the Reactor Protection System (RPS) (EIIS:JC). Operators implemented EOP-1 Standard Post Trip Actions, stabilizing the unit in Mode 3 utilizing the Steam Bypass Control System (EIIS:SB) and by manually starting the 1A and 1B Auxiliary Feedwater Pumps (EIIS:BA). The event was diagnosed as an uncomplicated reactor trip and EOP-2, Reactor Trip Recovery, was implemented. After three sets of Safety Function Status Checks were satisfactorily accomplished as per EOP-2, the procedure was exited.

Troubleshooting effo
ts by utility maintenance system experts confirmed that the cause of the trip was isolated to the turbine control system (EIIS:JJ). Instrumentation & Controls (I&C) personnel placed temporary recorders on selected turbine Digitial Electro-Hydraulic (DEH) control power supplies to monitor their output. To assist in troubleshooting and root cause determination, a Westinghouse technical representative and an independent technical expert on turbine DEH control systems were brought to the St. Lucie Plant. I&C inspected selected turbine control circuit boards and found a failed filter capacitor on a turbine speed control card which utilized -15VDC power. The turbine speed control card was replaced. I&C then performed a simulation of turbine latch, roll, startup and shutdown with satisfactory results. With the turbine

shutdown, a simulation of loss of six turbine DEH control power supplies were made. A CPU core memory test and command test were also performed on the DEH system. A limited wiring check did not reveal any other problems.

After repairs were made, on 28 September the unit was returned to 100% power.

CAUSE OF EVENT

The turbine trip was caused by a momentary interruption of 15VDC bus power in the turbine DEH control system. Interruption of power to the + or - 15VDC bus will result in a turbine trip. The root cause of the momentary interruption of power to the 15VDC bus was most likely due to the failure of a filter capacitor in a turbine speed control circuit card. The purpose of this electrolytic capacitor is to remove AC noise from the DC bus. This capacitor is suspected to have shorted to common ground, momentarily dropping -15VDC voltage, and then to have failed open. The open capacitor condition then restored power to the -15VDC bus, masking the failure and making detection difficult.

ANALYSIS OF EVENT

This event is reportable under the requirements of 10CFR50.73.a.2.iv as an event that resulted in a manual or automatic actuation of any Engineered Safety Feature.

Loss of a turbine DEH control system 15VDC bus will result in a turbine trip and reactor trip by design. The plant response during this event was bounded by Section 15.2.7 of the St. Lucie Unit 1 FSAR, "Loss of External Electrical Load and/or Turbine Stop Valve Closure." The plant response was much more conservative than what is described in the FSAR for several reasons:

1) The actual plant power level was 43% versus the assumption of full power.
2) The RPS actuated on a Loss of Load signal versus the assumption of High Pressurizer Pressure. This minimized RCS temperature and pressure post trip.
3) The primary system code safety valves were not challenged during this reactor trip as is assumed in the FSAR.
4) A Pressurizer Power Operated Relief Valve was available during this event while none are assumed operable in the FSAR.
5) The main steam safety valves were not challenged post trip as is

assumed in the the FSAR analysis. This was due, in part, to the low initial power level.
6) The Steam Bypass Control System operated as required for decay heat removal during this event.

This event was replicated on the St. Lucie Plant simulator to assist in root cause analysis. The Technical Staff compared the data from the simulator with the transient data obtained during the reactor trip. No unexpected differences were noted during the review.

The health and safety of the public were not at risk at any time during this event.

CORRECTIVE ACTIONS

1. The failed turbine speed control circuit card was replaced by I&C. The capacitor will be evaluated to determine the specific cause of the failure and any generic implications.

2. The I&C Department has verified the operability of other turbine DEH control circuit cards, looking for similar capacitor failures and other causal factors.

3. I&C has verified the operability of the + and - 15VDC and + 48VDC power supplies in the turbine DEH control system.

4. A comprehensive checkout of the turbine control system was performed prior to Mode 1.

5. Non-utility technical representatives were consulted to assist in troubleshooting and to validate the root cause of this event.

ADDITIONAL INFORMATION

Failed component identification:

Capacitor - 100 uf 25 volt
Model - 172374-015
Supplied by Westinghouse

Turbine Speed Control Channel 'A' Circuit Card
Style - 398779 G01
Manufacturer - Westinghouse

Previous Similar Events:

There are no previous LERs at St. Lucie Plant involving equipment malfunction in the turbine DEH control system which have resulted in an automatic reactor trip.

ATTACHMENT 1 TO 9210260299 PAGE 1 OF 1

P.O. Box 128, Ft. Pierce, FL 34954-0128

October 22, 1992

FPL

L-92-302
10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 92-006
Date of Event: September 24, 1992
Automatic Reactor Trip on a Turbine
Generator Loss of Load Signal
due to Equipment Failure

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

D. A. Sager
Vice President
St. Lucie Plant

DAS/JWH/kw

Attachment

cc: Stewart D. Ebneter, Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

DAS/PSL #805-92

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